CREATOR
VOLUME 20 NUMBER 3

MANY POINTS OF VIEW

The eyes of all look to You,
And You give them their food in due time.
Psalm 145:15

The kindest, most loving thing we can do for anyone is present to them the glory of Christ. And then pray that God would open the eyes of their hearts to see Jesus (John 9:38; Heb. 12:2) in all His majesty. Unless folks are convicted and comforted by His glory, they will continue to reject, even rage against God and His servants. Jesus was very clear about this in His teaching: "For the heart of this people has become dull, with their ears they scarcely hear, and they have closed their eyes, otherwise they would see with their eyes, hear with their ears, and understand with their heart and return, and I would heal them" (Matthew 13:15).

Seeing is essential to life: physical eyes for life here on Earth and spiritual eyes (Ephesians 1:18) for life eternal. Come with us now and explore the seemingly countless ways that our Lord Jesus Christ has blessed His creatures with eyesight. Along the way, we will be able to gaze together at the glory of our Creator with the eyes of faith (please read John 9).

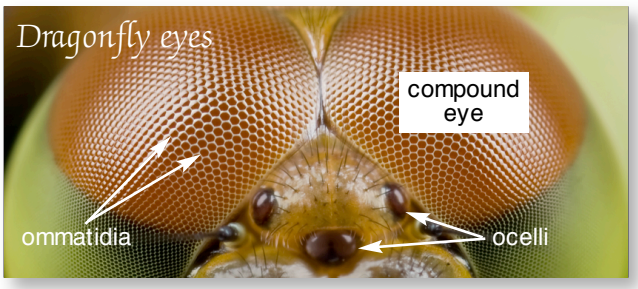
1 Read about electromagnetic radiation in ***CREATOR*** Vol 20 Num 1.
2 Squid and octopi are not vertebrates, yet God in His sovereignty saw fit to gift them with this highly complex eye type.

MANY TYPES

Our Lord provides His creatures with eyes of many shapes, sizes, and colors. If someone were to thoroughly examine the different kinds of eyes that Christ Jesus has created, doubtless it would take them several lifetimes to complete their study. Yet, each eye performs the same basic function: all eyes—from those of human beings to earthworms—detect electromagnetic radiation.[1] This information is converted into electrical signals, which are then transmitted to the brain.

We can roughly divide eye types into the following categories (though in reality, Christ's creation of vision is *much more* complex):

- simple eye spots—earthworms, jellyfish
- stemmata (lateral ocelli)—fleas, springtails, caterpillars, grubs, maggots
- ocelli (pronounced oh - SELL - ee)—insects, spiders, scorpions, horseshoe crabs
- compound eyes—insects, horseshoe crabs, lobsters, crabs
- vertebrate eyes—humans, mammals, birds, reptiles, amphibians, fish, squid, octopi[2]



THE COMPOUND EYE

Many invertebrates (insects, crayfish, lobsters, crabs, shrimp) possess compound eyes. A compound eye is composed of hundreds or thousands of tiny tubes known as *ommatidia* (om - ah - TID - ee - ah) each acting as a single eye. It is the combination of all these visual sub-units working together that gives a dragonfly, for instance, a relatively decent, though somewhat nearsighted, view of the world. In the case of insects, crayfish, and crabs, each ommatidium (singular for ommatidia) is constructed by Jesus using a microscopic lens placed on top of a clear cone of crystalline material, which is located above light-sensitive cells. Surrounding the cone and photoreceptor cells are dark pigment cells that prevent light from scattering from one ommatidium to another. This allows the invertebrate to see the best possible image of its environment. And this special design loudly proclaims Christ's great care for even the lowest of His creatures, as well as the genius of His creative mind!

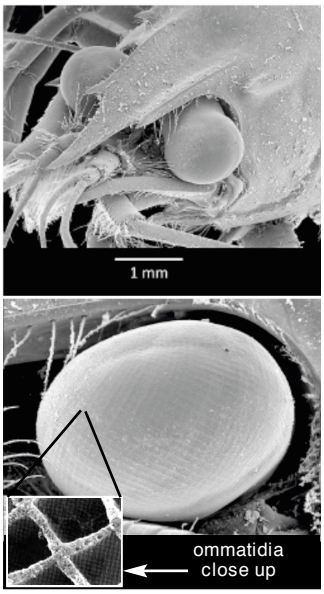
But dragonflies—which have the most complex compound eyes of all insects, each containing almost 30,000 ommatidia—do not see the world quite as we do. Their eyes are not designed by God to give clear, photographic-type vision, which we are blessed with, but rather the keen ability to detect subtle motion in their surroundings. Have you ever tried to sneak up on a dragonfly? Unless you creep *very slowly*, it will notice your every movement. This provides creatures with compound eyes the necessary skill to capture fast-moving prey and avoid even faster-moving predators.

In addition, our Lord mysteriously formed the brain of the dragonfly so that it perceives life slowed down. A quick-winged bird is seen in slow motion, allowing the dragonfly the opportunity to avoid becoming the bird's next lunch. How this happens in the mind of the insect, only God knows for sure; this we do know—no one is kinder than our Creator Jesus.

LOBSTERS & X-RAYS

When you think of a lobster, what comes to mind? Delicious seafood? I'll bet you've never considered that we might be able to use the eyes of this creature to help us observe the glory of our Lord throughout the universe. In December 2012, NASA launched an instrument into space with "lobster eye optics" that allowed us to detect X-rays produced by solar wind. And NASA scientists are developing the "Lobster Transient X-ray Detector," which could be used on the International Space Station to detect potentially dangerous x-rays produced by black holes, neutron stars, supernovae, and gamma-ray bursts.

These special devices are based on Christ's design of the crustacean's eyes. Like the compound eye of an insect, a lobster's eye is composed of ommatidia in the thousands. Unlike an insect, however, the ommatidia of a lobster are square, not six-sided as with a honeybee or a dragonfly. This extraordinary design allows the lobster to focus its eyes underwater using tiny mirrored boxes rather than lenses, which don't work so well in a liquid environment. Each side of the perfectly square ommatidium is lined with an organic material that acts like a shiny mirror. Using mirrors rather than lenses, the lobster can see very dim objects at the bottom of the sea and with less distortion.



The folks at NASA were so impressed with our Lord's design, they decided to apply the

same technology to x-ray detectors, and to launch a lobster's eye into space . . . well, a replica of it, at least. This prototype successfully detected x-rays produced by the Sun. It was quite an achievement since there is no way to create a lens that can focus x-rays since x-rays pass through most materials, including glass. But scientists reasoned that if engineers could build a replica of the lobster's eye using lead-lined[3] reflective tubes, then it might be possible to focus x-rays in the same way that lobsters focus visible light in the sea. This way, scientists could more accurately detect x-rays produced by merging black holes and supernovae, something which has eluded astronomers up until now.

So, in addition to their tasty qualities, lobsters are, in fact, allowing us to peer deeper into the universe of God's glory!

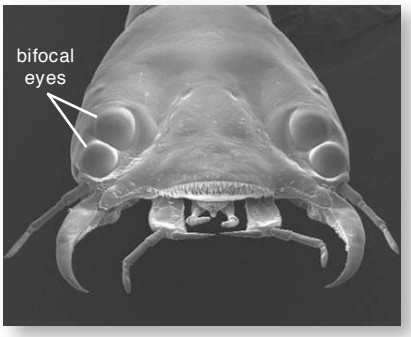
BIFOCALS

We often pride ourselves on our inventions. Any student of history will tell you that it was Benjamin Franklin who first came up with the idea of bifocal glasses to help him read. But sooner or later, we discover that Jesus has long used "our invention" in nature. Such is the case with bifocals.

A little background: Our Lord has positioned soft lenses inside our eyes that automatically change shape as we interact with our world. By attaching tiny muscles to the edges of these elastic lenses, our Creator alters the refractive power of each lens without us even thinking about it, allowing us to see our world clearly—both near and far.

As we age, however, the protein lens in each of our eyes begins to stiffen and can no longer change shape. Also lost is the ability to focus on *both* near and far-off objects (older folks are usually able to do one or the other but not both). Franklin's bifocals solved this problem by incorporating two different lenses into the same pair of eyeglasses. The upper lens helped the wearer to see distance while the lower lens could be used for reading.

Recently—and here's where the balloon of our inventive pride pops—entomologists[4] have discovered an insect with bifocal eyes. This unique animal is the larva of the sunburst diving beetle (*Thermonectus marmoratus*),



Face of sunburst diving beetle larva

which populates the streams and creeks of the western United States. The larva possesses 12 eyes, four of which are fitted with bifocals. This greatly assists the insect in capturing its favorite meal—mosquito larvae. So, in fact, God is the one who invented bifocals!

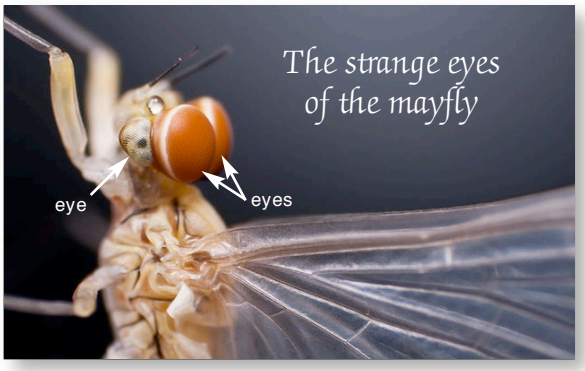
"THE MORE THE BETTER"

If we study the wide range of creatures God put on Earth, we will eventually discover that most animals *do not* have just two eyes:

- Some scorpions, like the larvae of the sunburst diving beetle, have 12 eyes.
- The tuatara—a reptile from New Zealand—sports a third eye on top of its head.
- Spiders usually possess 8 eyes, but some have 6, 4 or 2. Cave spiders often have none.
- The horseshoe crab has two compound eyes, five small eyes on top of its head, two eyes in the middle of its body, and an eye spot under its tail, for a total of 10 eyes.
- Seven eyes are rare in nature—most insects

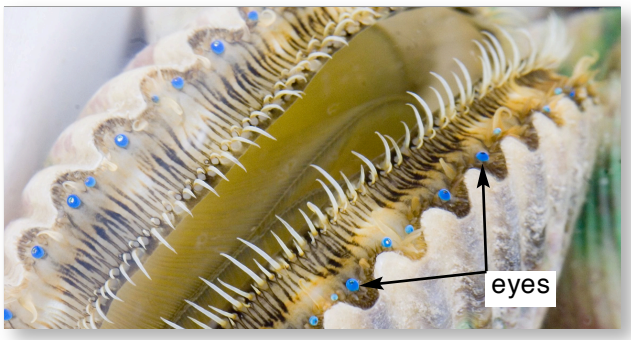
3 Lead is one material that x-rays cannot pass through.

4 Entomologists are scientists who study insects and spiders.



have five—but Christ Jesus supplied the mayfly with this "divine number" of eyes. (Please read Revelation 5:6.)

- The surface of a fruit fly larva is covered in cells that detect light—its skin literally "sees." Even more amazing is that the Lord creates the multiple eyes of an adult fly from scratch, orchestrating an extremely complex series of changes in the larval body (which has no head) to produce an essentially different creature.
- Starfish (sea stars) and brittlestars have as many eyes as they have arms, one eye on the end of each arm. This means that some brittlestars are gifted with as many as 40.
- The outer rim of a scallop is ringed with 50 to 100 tiny blue eyes. (This might remind us of the description of cherubim in Ezekiel 1.)



- If we consider each ommatidium of a dragonfly's compound eyes as an eye in its own right, then dragonflies own the world record with almost 60,000 eyes!
- Scientists have tried to understand the bewildering array of different types, numbers, and arrangements of eyes in the insect world, but in the end continue to be amazed by its incredible complexity. The various ways Christ designed the eyes of insects is *truly astounding*.

COLOR VISION

Most animals probably see the world quite differently than we do. Among God's creatures, we have excellent color vision, although some people cannot see green or red.[5] Dogs and cats are far superior to us in hearing and the sense of smell, but are quite limited in their ability to detect color. It is believed that dogs can see yellow, blue, and gray, but that cats have even poorer color vision, especially during the daytime. Monkeys, fish, and insects, on the other hand, possess fairly good color perception, although not as good as our own. Of vertebrates, birds and reptiles have the best color vision. Jesus, for instance, placed five different color receptor cells in the retina of pigeons (our eyes have three color receptors). Pigeons see the same colors as we do, but are able to distinguish between thousands, possibly millions of hues. Experiments have shown that this common bird can tell the difference between two shades of color that look absolutely identical to us. So pigeons are far more special (and glorifying to God!) than we give them credit for.

Many animals actually detect more colors than we can. The goldfish sees all the colors of the rainbow, plus infrared and ultraviolet (UV) light—two colors we cannot see. Bees cannot detect red, but can see UV light. Of all Christ's creatures, however, the mantis shrimp is probably the supreme master of color detection.

5 Read about red-green colorblindness in ***CREATOR*** Vol 11 Num 4.

THE MANTIS SHRIMP

Neither a praying mantis nor a shrimp, the mantis shrimp is a colorful crustacean that populates tropical oceans. It possesses the most complex, and possibly least understood, vision in the animal kingdom. Its strange lobe-shaped eyes are perched on top of two stubby stalks. Our Lord Jesus has divided each eye into three distinct zones, giving this creature

the unique talent of *trinocular vision*. (We can only imagine what it sees with these three-part eyes.) Even if it lost one of its eyes, the mantis shrimp would have better depth perception using one eye than we have with two.

The different species of mantis shrimp have between 12 and 16 types of color receptors in their retina. This is four to five times more than we possess. Research has shown that they see all of the colors we do, but their world is also decorated in additional colors found in the ultraviolet spectrum. Exactly how many more colors the mantis shrimp sees is not certain, but evidence seems to point to at least *six additional* colors we know nothing about.

Scientists are scratching their heads trying to comprehend why this crustacean has such phenomenal UV vision.[6] What purpose does it serve? As with many insects, the mantis shrimp also detects polarized light. (This ability is shared with bees and butterflies, which use it to see the position of the sun even on cloudy days, helping them navigate when they fly.) To complicate matters, mantis shrimp can see circular polarization as well—light that is "twisted" both clockwise and counterclockwise.[7] Since no other animal that we know can detect the circular polarization of light, behavioral scientists believe that this strange skill allows male and female mantis shrimp to share between them a secret "love language" that only they can understand. It's rather sweet of our Lord to give them this, don't you think?

THE SQUID AND THE OCTOPUS

It might surprise you to learn that the eyes of a squid and an octopus are very similar to the eyes we possess. The big difference is that the lens inside their eye is spherical rather than flattened as ours is. Fish and snakes also have spherical lenses, which must be moved back and forth within the eye in order to focus upon something. The same is true for squid and octopi. We, on the other hand, use tiny muscles to change the shape of our lenses, allowing for accurate focusing. Otherwise, the eye of a squid is very similar to our own . . . except for size, that is. The colossal squid (*Mesonychoteuthis hamiltoni*) possesses the largest eyes in the world. Measuring almost 12 inches (30 cm) in diameter—the size of dinner plates—there's no doubt that this particular species of squid was gifted with such enormous eyes to enable it to gather as much light as possible in the dark depths of the ocean where it lives.[8]

6 Most creatures with compound eyes can detect UV light, but none as well as the mantis shrimp.

7 A discussion of the polarization of light is beyond the scope of this article. Check out www.youtube.com/watch?v=HH58VmUbOKM

8 This squid can reach depths of at least 7,200 feet (2.2 kilometers) where it is perpetual "night."

A BIRD'S EYE VIEW

If you want to be further amazed and delighted by the creative hand of Christ, you need look no further than birds of prey. When it comes to visual acuity, two things stand out with these animals: 1) their phenomenal ability to see distant objects and 2) their ability to quickly change focus as they dive.

Birds of prey are unique in the avian world because God has given them the capacity to focus using not only the lenses of their eyes, but their corneas[9] as well. This dual-focusing talent allows birds like the osprey or the peregrine falcon—which can reach speeds in excess of 200 mph (320 km/h)—to plunge downward toward the earth while keeping their prey in focus, and not hit the ground.

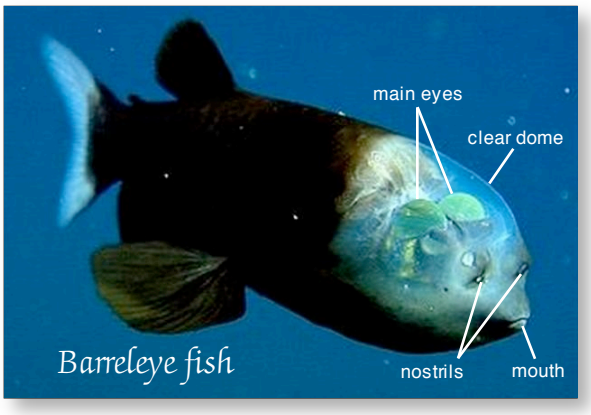
Eagles and vultures are renowned for their skill at scanning great distances in search of food. Eye specialists have measured the vision of these birds and have discovered that their visual acuity is between 20/5 and 20/4 (normal human vision is 20/20). This means that an eagle or a vulture can spot something on the ground four or five times farther away than we can. Another way of "looking" at this is that they can see an ant crawling on the ground from ten stories high in the sky.

NIGHT VISION

On Earth, the illumination from stars is less than a millionth of the sun's light. Despite this scarcity of light, our Lord has fully equipped nocturnal animals with eyes that pierce the darkness.

The helmeted gecko (*Tarentola chazaliae*) has the best nighttime color vision of all animals—its eyes are 350 times more sensitive to colors than ours. The tarsier[10] of Southeast Asia has the keenest eyesight of all nocturnal mammals. And it possesses the biggest eyes, *relative to its body size*, of any animal on Earth, including the colossal squid. Larger eyes allow it to gather in more light, much like larger buckets allow someone to carry more water.

Many of the fish that live in the twilight world of the deep ocean also possess large and sometimes grotesque-looking eyes. But the strangest and most versatile eyes in all creation belong to the barreleye fish, also known as the spookfish.



Our Lord Jesus fashioned its eyes to resemble stubby telescopes that point straight up. And like the telescopes of the professional astronomer, the tube-like eyes of this fish are housed in their own dome-shaped "observatory" of sorts. Instead of a hardened, dense cranium, Jesus gave the barreleye fish a soft, transparent membrane that covers the front part of its head. This living helmet protects its sensitive eyes from the stinging cells of siphonophores,[11] which it frequently encounters in the sea, while allowing a clear view of its surroundings. The spookfish uses its surface-gazing vision to spot potential prey (or predators) silhouetted against the dim light coming down from above.

If our understanding of spookfish anatomy ended here, it would be remarkable enough and a sweet testimony to the far-reaching creative genius of Christ. But this is only half of the story.

9 The cornea is the clear surface at the front part of your eye.
10 See a photo of a tarsier on the ***kids' kreation*** page.
11 Siphonophores are long, transparent, ocean invertebrates. You can see a photo of a siphonophore on page 4 of ***CREATOR*** Vol 18 Num 1.

Budding off each side of its main eye tubes is a mirrored chamber—called a *diverticulum*—with an opening that *points downward*. Faint light from bioluminescent creatures swimming below the fish enters these auxiliary eyes from underneath and is both reflected and focused by shiny tissue lining the upper surface of the diverticulum. It turns out that, in water, this mirror design is actually better at gathering and focusing light than a lens (see our discussion of lobster eyes). This dual design of barreleye sight allows it to keep watch on activity both above and below the fish at the same time.

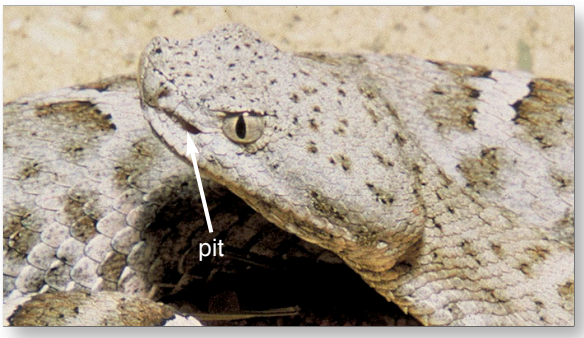
Excellent night vision is not limited to vertebrates; after all, God is concerned for all of His creatures. There is a spider in Australia—the ogre-faced spider—that is able to see better at dusk than many of the animals we often credit with good night vision. In the dark, its vision is 20 times better than our own. And its eyes (with an f-number of 0.58 or f/0.58)[12] are more sensitive to photons than those of a cat (f/0.9) or an owl (f/1.1). Our Lord Jesus has coated

the inside of this spider's eyes with a special light gathering membrane; each morning the membrane is destroyed in the bright glare of day, but re-formed again by our Lord every evening. (The cost of having sensitive eyes makes it difficult to maintain vision during the day. The vision of the Norway lobster—*Nephrops norvegicus*—is so delicate that it will go blind if it is suddenly exposed to bright daylight.)

12 As with cameras, the lower the f-number of an animal's eye, the better its light gathering capacity.

Another way that Christ Jesus improves night vision in many animals is through something He invented known as the tapetum (tah - PEE - tum). If you have ever walked in the woods at night with a flashlight in hand, you probably have noticed how the eyes of animals *glow* in the dark when light is shined on them. This spooky *eyeshine*, as it's called, is caused by the reflection of your light off the rear of their eyes. Jesus coated the back of the eyes of many animals with a layer of highly reflective cells (the tapetum) located behind the retina. The tapetum acts like a mirror, and helps concentrate the light that the eyes receive.

In addition to providing night vision, our dear Lord Jesus gives some of His creations the ability to see heat (infrared radiation). Most famous for this are the pit vipers, which include rattlesnakes of the Americas. Christ placed a small pit on either side of the snake's face—between its eyes and nose. He then lined



New Mexico ridge-nosed rattlesnake (*Crotalus willardi obscurus*)

these pits with tissue that contains a special heat receptor protein called TRPA1.

It might surprise you to learn that this same receptor protein is found in our nasal passages. But the receptors in our nose cannot detect heat—rather, they produce pain when we eat spicy foods like wasabi, Chinese mustard, and hot peppers.

Crabs living near deep-sea thermal vents also see heat. This keeps them from wandering too close to the vents and being scalded. God is so compassionate!

PHILADELPHIA OR LAODICEA?

Sight is obviously important to our Creator; maybe this is why Christ Jesus designed so many varieties of eyes rather than creating them all the same. Here on Earth, different ecosystems and habitats present unique challenges to His creatures as they maneuver through their environment. The visual requirements of a snake making its way at night across the desert floor are quite different from those of an eagle soaring high in the sky.

The need to find food and shelter is very real in the physical world, but this is not the ultimate aim of eyesight. God desires creation to see and worship His Son (John 9:38; Revelation 4:5-11). This is especially true of His people (John 17:24). One of the important lessons that Christ's boundless creation of eyes teaches is that He is infinitely able to provide us the vision needed to see and enjoy His glory. This is no small feat considering the brilliance of His majesty (Matthew 17:1-6).

The worst thing about Hell is that the damned will be exposed to the full force of God's awful presence, yet have *no sight* of Christ's beautiful face (please read Psalm 143:7). Conversely, the most blessed creatures of Heaven may be those cherubim,[13] who were seen by the prophet to possess countless eyes with which to gaze upon their Creator (read Ezekiel 1:18, 26 and especially 10:12; Revelation 4:6). It is this sight of God's glory that makes the difference between misery and delight. Jesus was able to endure the pain of the Cross because He experienced *the joy of seeing* His Father's glory (Hebrews 12:2).

A careful study of Christ's rebuke of the Laodiceans in Revelation 3 reveals that they were a church that lacked zeal for God and had virtually no sight of Christ in their lives. As such, our Lord advises them to "buy eye salve" so that they might see (v. 18). Jesus here is not referring to diseases of the eye, but defective spiritual sight. How did the Laodicean church come to such a deplorable state in the first place? They were a worldly church, *disobedient to God's Word*. As a body, they became self-satisfied and lacked a hunger and thirst for the Living God (please read Psalm 42:1-2).

The church of Philadelphia, on the other hand, was a body of Believers who were fully committed to love and obey God (John 14:21). They did not compromise even in the midst of trials. As a result, they had little worldly power. Yet look what Christ promises them—"he who overcomes, I will make him a pillar in the temple of God" (Rev. 3:12). In other words, the Philadelphian Believers would be granted a "permanent front row seat" in Heaven, so they might forever see and enjoy the ineffable beauty of our Lord in fellowship with Him!

O let us join the church of Philadelphia, and with zeal seek the face of our Lord Jesus Christ with the eyes of faith (Ephesians 1:18; Hebrews 12:2). This requires that we eliminate the things from our lives that take our focus off Jesus (see Hebrews 12:1). With clear eyes and pure heart, let us keep Christ's commands, found in His Word, with universal obedience (John 14:21). ❑

13 Cherubim, being spirits like all angels, are invisible to our eyes, but in Ezekiel are *represented* as physical beings for our benefit.

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